REMARKS

Claims 1-12 are pending in the present application. Claims 1, 5 and 8 are herein amended. No new matter has been entered.

Objections to Claims

Claim 5 was objected to because in line 10 in the term "a nozzle in communication with the in communication with discharge vale" the underlined term "with the in communication" should be cancelled.

By this amendment, claim 5 was amended to overcome this objection. Thus, Applicant respectfully requests the Examiner to withdraw this objection.

Rejections under 35 USC §103(a)

Claims 1-3 and 5-11 were rejected under 35 U.S.C. 103(a) as being obvious over Suovaniemi et al. (U.S. Patent No. 5,343,769) in view of Suovaniemi (WO 91/16977) and Lewis et al. (U.S. Patent No. 5,927,560).

The Examiner alleged that Suovaniemi et al. ('769) discloses "a metering tube (the bottom half portion of 6 where plunger 4 closely fit in fig. 2) having a columnar internal space formed substantially the same diameter" (Office Action, page 2, last 4-2 lines). However, this allegation is incorrect because Fig. 2 of Suovaniemi et al. ('769) shows liquid volume 6 with

tapered shape. Also, as pointed out in applicants' Response dated May 28, 2008, Suovaniemi et al. ('769) describes as follows:

> "The terminal deceleration is useful for the reason that owing to the tapering shape of the pipette's tip portion the velocity at which the level of the liquid discharges from the tip rises to very great height towards the end if the piston moves at uniform velocity, and because of this high velocity some liquid may remain on the inner surface of the liquid volume 6."

(Suovaniemi et al. ('769), column 6, lines 3-9). Thus, the Examiner's allegation that "Suovaniemi et al. ('769) discloses "a metering tube having a columnar internal space formed substantially the same diameter" is not supported in the evidence.

The Examiner further alleged as follows:

> Suovaniemi et al. ('769) further teaches ... thereby discharging a first droplet from the nozzle (by the dispensing steps A, B, C, … in fig. 5); controlling (using the controller 13 in fig. 4) moving speed of the plunger (4) during steps of deceleration, acceleration, and constant speed (see figs. 3-5 and the related text).

(Office Action, page 3, lines 4-7). The Examiner's allegation again is not correct. Suovaniemi describes as follows:

> The movement of the threaded rod 9a and the threaded sleeve 9b and at the same time the movement of the plunger 4, can be arrested with the aid of the brake means 10.

(Suovaniemi et al. ('769), column 3, lines 36-39).

> Intake aspiration during the acceleration step A1, suction rate is accelerated to constant level B1, which is maintained until close to C, the desired intake volume. At C, deceleration of the motor is commenced, and when the desired intake volume has been reached, suction is stopped with the aid of the brake means at D1.

(Suovaniemi et al. ('769), column 5, lines 52-58).

> In the filling operation, there is similarly at first an acceleration step, then a uniform suction step, which terminates in deceleration and termination by braking.

(Suovaniemi et al. ('769), column 5, line 68 to column 6, lines 1-2).

Thus, according to Suovaniemi et al. ('769), the device has a "brake means 10" and the "threaded rod 9a" is suddenly stopped by the braking means at the end of the discharging operation. This can be confirmed by Fig. 5 shown below (explanation added).

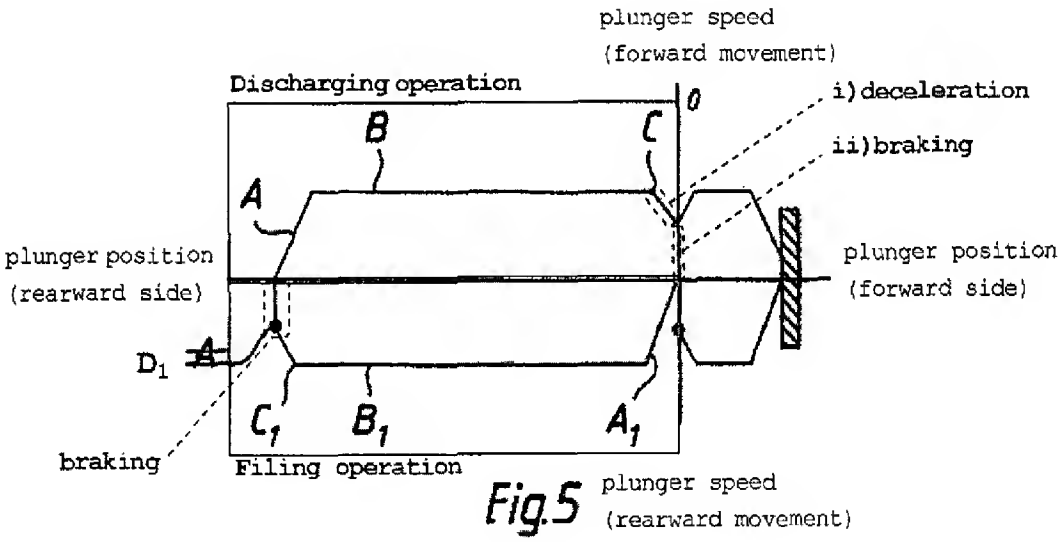

Fig.5

Thus, in Suovaniemi et al. ('769), the stopping operation includes i) deceleration and ii) sudden braking, and the deceleration to the stop is not controlled. According to Suovaniemi et al. ('769), the terminal deceleration is useful for the reason that owing to the tapering shape of the pipette's tip portion (Suovaniemi et al. ('769), column 6, lines 3-9 shown above). If pipette's tip portion were of "substantially the same diameter" but not of a "tapering shape," the stopping operation would include only the sudden braking.

When a plunger is suddenly stopped, discharged liquid tends to be divided into two or more drops because of the excessive inertia force caused by the difference in speed between the liquid and the plunger. This difference from the present invention is significant.

According to the present invention, the plunger is not suddenly stopped without control. The speed of the plunger from a start of a deceleration to a stop of the plunger is controlled during the steps of moving forward and stopping the plunger such that the first droplet and the second droplet are of the same quantity. Thus, the discharged liquid droplet is infallibly separated from a discharge port of the nozzle tip and the liquid droplet is not divided into two or more droplets.

The same thing can be said about Suovaniemi (WO 91/16977). As shown in Figs. 2-5, the plunger is suddenly stopped after deceleration. Because a plunger is suddenly stopped, discharged liquid tends to be divided into two or more drops because of the excessive inertia force caused by the speed difference between the liquid and the plunger.

Neither does Lewis et al. teach or suggest that speed of the plunger from a start of a deceleration to a stop of the plunger is controlled during the steps of moving forward and stopping the plunger such that the first droplet and the second droplet are of the same quantity.

For at least these reasons, claim 1 patentably distinguishes over Suovaniemi et al.('769), Suovaniemi (WO 91/16977) and Lewis et al. Claims 2, 3, 8, and 11, depending from claim 1 also patentably distinguishes over Suovaniemi et al('769)., Suovaniemi (WO 91/16977) and Lewis et al. for at least the same reasons.

Claim 5 similarly recites "wherein the controller controls a moving speed of the plunger from a start of a deceleration to a stop of the plunger in the steps of moving forward and stopping the plunger such that the first droplet and the second droplet are of the same quantity."

For at least substantially the same reasons as discussed above, claim 5 patentably distinguishes over Suovaniemi et al. ('769), Suovaniemi (WO 91/16977) and Lewis et al. Claims 6, 7, 9 and 10, depending from claim 5 also patentably distinguishes over Suovaniemi et al. ('769), Suovaniemi (WO 91/16977) and Lewis et al. for at least the same reasons.

Claim 12 was rejected under 35 U.S.C. 103(a) as being obvious over Suovaniemi et al. ('769) as modified by Lewis et al. and Suovaniemi (WO 91/16977) above and further in view of Horsnell et al. (US 2005/0231553).

Claims 12, depending from claim 1, also patentably distinguishes over Suovaniemi et al. ('769), Suovaniemi (WO 91/16977) and Lewis et al. for at least the same reasons.

The Examiner alleged that Horsnell et al. teaches "the plunger is moved by a regulated amont (due to the application of the second portion of the driving wave forms in figs. 16a, 16b, and the movement of the plunger such as 1 in fig. 1 is controlled by controller in figs. 10, 16. see also paragraph 0165)." However, Horsnell et al. discusses control of valve operation, but it does not disclose control of the speed of the plunger (see Horsnell et al., paragraph [0135] and [0141]).

In Horsnell et al., pad 15 at the end of plunger 15 touches jewel nozzle 12 when the droplet is discharged. Thus, in Horsnell et al., a single charge of the liquid material is discharged in a single step of moving the plunger forward. Therefore, Horsnell et al. does not teach or

suggest "moving the plunger forward from a first position and stopping the plunger at a second position while the liquid material supplying valve is in the closed position and the discharge valves is in the open position, thereby discharging a first droplet from the nozzle"; and "moving the plunger forward from the second position and stopping the plunger at a third position while the liquid material supplying valve is in the closed position and the discharge valves is in the open position, thereby discharging a second droplet from the discharge port." Therefore, Horsnell et al. does not remedy the deficiencies of Suovaniemi et al. ('769), Suovaniemi (WO 91/16977) and Lewis et al.

For at least substantially the same reasons as discussed above, claim 12 patentably distinguishes over Suovaniemi et al. ('769), Suovaniemi (WO 91/16977), Lewis et al. and Horsnell et al.

In view of the aforementioned amendments and accompanying remarks, Applicant submits that the claims, as herein amended, are in condition for allowance. Applicant requests such action at an early date.

If the Examiner believes that this application is not now in condition for allowance, the Examiner is requested to contact Applicant's undersigned attorney to arrange for an interview to expedite the disposition of this case.

If this paper is not timely filed, Applicant respectfully petitions for an appropriate extension of time. The fees for such an extension or any other fees that may be due with respect to this paper may be charged to Deposit Account No. 50-2866.

Respectfully submitted,

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